Summary of the QCD Parallel Session in QM'97 *

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Though ultrarelativistic heavy-ion collisions are engineered to discover and study the deconfined phase of nuclear matter, *i.e.*, Quark Gluon Plasma (QGP), it encompasses virtually every aspect of QCD theory, from perturbative QCD (pQCD) hard processes to nonperturbative hadronization, from parton equilibration to medium modification of hadron properties. They provide an unprecedented opportunity to study the QCD theory at vastly different environments. These different aspects of QCD, dominant at different stages of the high-energy heavy-ion collisions, can be characterized by the time or energy scales. During the earliest stage of the collisions at energy scale larger than ,*i.e.*, $Q_0 = 2$ GeV, pQCD processes dominate and are responsible for production of Drell-Yan dileptons, direct photons, jets and J/Ψ. Minijet production at this stage is also important to form a dense partonic matter. Among all proposed probes of high-energy heavy-ion collisions, these are the only ones whose initial production rate can be calculated within the pQCD framework which has been successfully tested in e^+e^- annihilation, deeply inelastic e^-p and pp or $p\bar{p}$ collision processes. The few uncertainties involved are the effects of initial state interactions, *e.g.*, parton shadowing and the so-called Cronin effect, which are also interesting by themselves. Talks by Sarcevic and Guo are devoted to these topics.

At late times when the system is still dominated by partonic degrees of freedom, interactions among the produced partons will drive the system toward equilibrium. The question of equilibration of the system bears significant importance in the study of the formation of quark-gluon plasma. It determines how strongly partons interact with each other in the system and how long the partonic phase will last. During this period of time, or the life-time $t_{\rm QGP}$ of the parton system, there will be associated thermal production of particles which can also be used as signals of the dense QGP matter. Talks by Sakai and Wong address some issues in this stage.

When the energy scale in the system drops to around the value of $\Lambda_{\rm QCD}$ hadronization will convert partons into hadrons. The process is purely nonperturbative and so far there has not been any known description of this process from QCD theory. It is not clear at all whether the system is in equilibrium during the hadronization process. When the hadronization happens in the vacuum as in e^+e^-, ep, pp and $p\bar{p}$ collisions, phenomenological parameterizations of the so-called fragmentation functions are normally used. An exponential form motivated by vacuum tunneling in a strong field is normally used to describe the mass and transverse momentum distribution of the produced particles. Under different environments such as in high-energy heavy-ion collisions, the parameters governing the hadronization will also be different. If the hadronization happens in a nonequilibrium environment, then the signals of the initial strangeness enhancement during the partonic phase might easily get lost in the hadronization process which also produces strange particles. One might also use statistic approach as by Becattini *et al* to describe the particle production based on the occupation of the phase space. However, one must bear in mind that the so-call temperature parameter extracted from such an analysis has nothing to do with the temperature of an equilibrated system and thus cannot be put on the usual phase diagram.

After the hadronization stage, the interaction among hadrons might be described by some effective theories in which one can discuss physics phenomena such as medium effects in hadron properties and disoriented chiral condensates. The talk by Mishustin discusses a model of chiral phase transition. Talks by Alam, Rajagopal and Schäfer demonstrate the renewed interests in the physics at high baryon densities.

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